PROPOSED MONITORING PLAN

North Mecklenburg Construction and Demolotion Landfill
15300 Holbrooks Road
Huntersville, North Carolina

Permit # 60-13

ESI Project No. ES-675

February 22, 1995

-Prepared for-

Mr. Larry Griffin, Sr.
19141 Highway 73 West
Davidson, North Carolina 28036

-Prepared by-

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Paul A. Banks, P.G.
Project Geolgist

MONITORING PLAN OBJECTIVE

The proposed groundwater monitoring plan is intended to determine groundwater quality associated with the operation of the Phase I and Phase II landfill tracts. Groundwater sampling activities will be performed semi-annually. This plan presents our recommended groundwater monitoring program which includes well locations, and groundwater sampling and chemical testing.

MONITORING WELL SAMPLING PLAN

Ecological Services, Inc. recommends that a groundwater monitoring program be implemented following the Phase II permitting of the subject site. To ensure adequate site coverage, ESI proposes that the following groundwater monitoring locations be sampled (Figure 1):

Site Boarder Monitoring Points

MW-1a
MW-4a
MW-4
MW-6a
MW-8
MW-10
MW-11

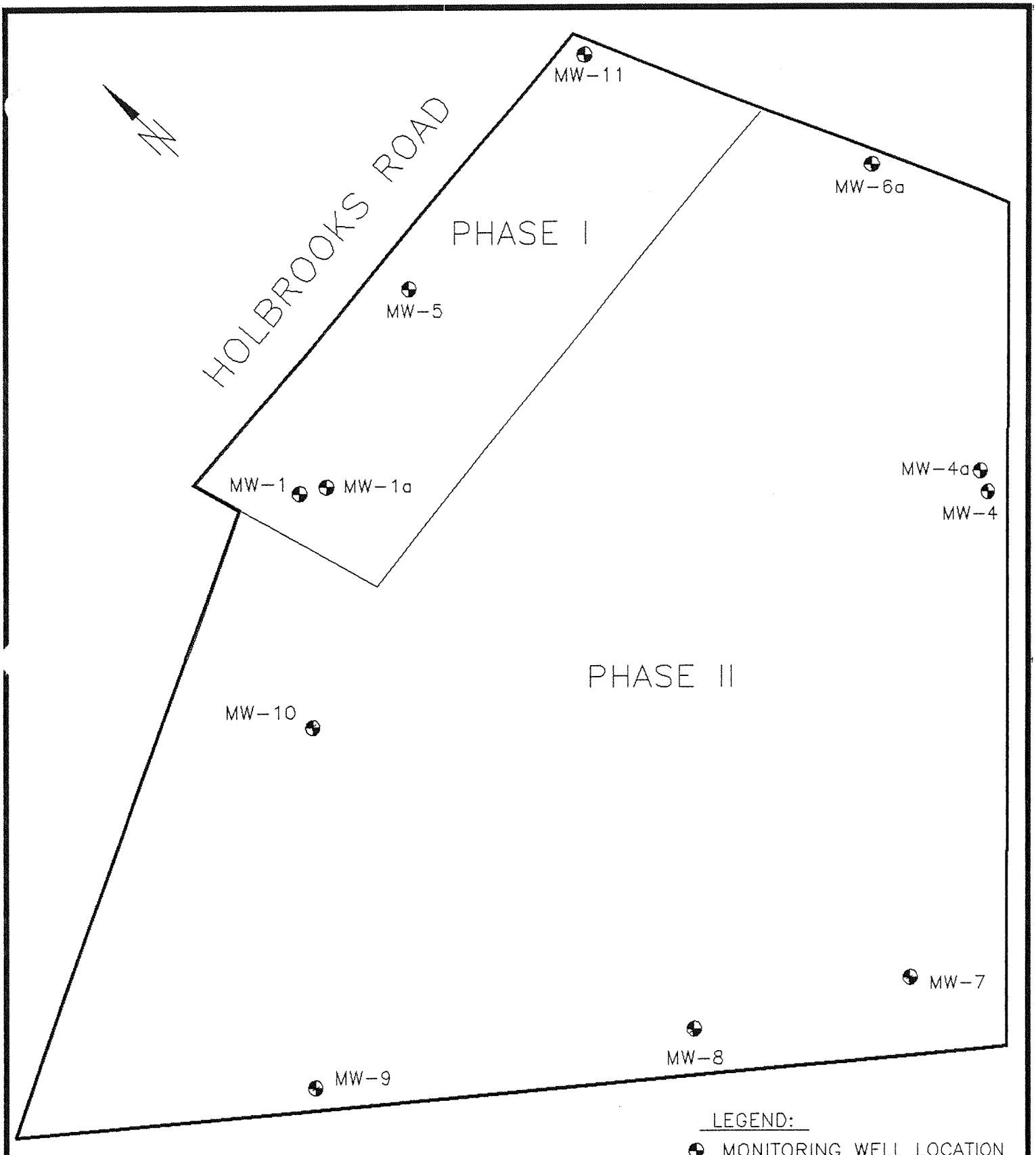
Well construction data is included in Appendix A of this monitoring plan.

Water levels will be measured prior to each sampling event with an oil/water interface probe to determine groundwater elevation. The monitoring wells will then be purged by bailing or pumping at least 4 times the water volume within the well, including the sand pack, or to dryness. After allowing each well to recover at least 60% of the initial head, or 24 hours, whichever occurs first, the monitoring well will be sampled using disposable EPA approved sampling bailers. At the time the water samples are collected from the wells, pH, temperature, and specific conductivity will be recorded in the field to ensure that representative groundwater is being obtained for chemical analysis. One field blank sample will be obtained in the field by pouring distilled water into a sampling bailer and then decanting the contents of the bailer into the appropriate glass container. A laboratory trip blank will also accompany the groundwater samples.

All groundwater samples will be properly preserved and shipped to a North Carolina Approved analytical laboratory for chemical analysis as outlined in the attached Solid Waste Section Sampling and Analysis Requirements (Appendix B). Appropriate chain-of-custody records will be maintained during each stage of sample collection and transportation.

PREPARATION

npletion of each semi-annual sampling event, a summary of our field activities, data, and laboratory results will be provided to the DEHNR-Solid Waste ent in a letter report.



Date: 02-23-95
Scale: 1" = 200'
Dwg. No.: ES675-1

ESI

Figure 1: Site Configuration Map
North Mecklenburg Landfill
Huntersville, North Carolina

APPENDIX A

Well Construction Data

Geologist Log

Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: 1-A	Page 1 of 1
County: Mecklenburg State: NC	Date Begin: 02/02/95 Date End: 02/03/95	Casing Height: 2.5 ft.	Land Surface Elevation:
Lat.: Long.:	Drilled By: Badger Well Drilling	Static Water Level:	
Grid Coor.:	Logged By: Mike Magnetti	Development Method:	
Tests:	Drilling Method: Auger/Air	Sampling Method:	
Grout: 5% bentonite: 0' to 7'	Seal: 7' to 9'	Gravel Pack: 8/20 Silica Sand: 9'to 25'	
Casing Type: Sch 40 PVC	Diameter: 2" Depth: 0' to 10'		Hole Dia.: 6"
Screen Type: Sch 40 PVC	Diameter: 2" Slot: 0.010-inch	Depth: 10' to 25'	Total Depth: 25.1'

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	Tan and Brown Silty Clay Medium to Fine Grain	0 — Grout 0' to 7'
			Weathered Bedrock	9' — Bentonite 7' to 9'
		10	Weathered Bedrock Saprolitic with an Increase in Cohesion and Resistance with Depth	Casing 0' to 10'
		20	Total Well Depth	20 — Screen 10' to 25' — Sand 9' to 25'
		30		30
		40		40
		50		50
		60		60

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Geologist Log — Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: MW-4	Page 1 of 1
County: Mecklenburg State: NC	Date Begin: Date End:	Casing Height:	Land Surface Elevation:
Lat.: Long.:	Drilled By: Graham & Currie	Static Water Level:	
Grid Coor.:	Logged By: Ben Hope	Development Method:	
Tests:	Drilling Method: Air Rotary	Sampling Method:	
Grout: 5% bentonite	Seal: 40-44 ft	Gravel Pack: FX 50 sand 44-67 ft	
Casing Type: Sch 40 PVC Diameter: 2"	Depth: 0 - 47 ft		Hole Dia.: 6"
Screen Type: Sch 40 PVC Diameter: 2"	Slot: 0.010-inch	Depth: 47-67 ft	Total Depth: 67 ft

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	0 - 30.0 ft: Tan Silty Fine Sand	0
		10		10
		20		20
		30	30.0 - 40.0 ft: Brown Silty Fine Sand	30
				Grout (0 - 40 ft)
		40	40.0 - 50.0 ft: Partially Weathered Bedrock Sampled as Tan Silty Fine Medium Sand with Rock Fragments	40
				Bentonite (40 - 44 ft)
				Casing to 47 ft
		50	50.0 - 67.0 ft: Gray Silty Medium Sand with Rock Fragments	50
		60		60
				Sand (44 - 67 ft)
				Screen (47 - 67 ft)
			Boring Terminated at 67.0 ft	
		70		70

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Geologist Log

Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: 4-A	Page 1 of 1
County: Mecklenburg State: NC	Date Begin: 02/02/95 Date End: 02/03/95	Casing Height: 2.38'	Land Surface Elevation:
Lat.: Long.:	Drilled By: Badger Well Drilling	Static Water Level:	
Grout: 5% bentonite 0' to 24'	Seal: 24' to 26'	Gravel Pack: 8/20 Silica Sand: 26' to 42'	
Casing Type: Sch 40 PVC Diameter: 2"	Depth: 0' to 27'		Hole Dia.: 6"
Screen Type: Sch 40 PVC Diameter: 2"	Slot: 0.010-inch	Depth: 27' to 42'	Total Depth: 42'

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	Brown and Tan Silty Clay Highly Weather Rock	0
		10	Weathered Saprolitic Bedrock Increase in Cohesion and Resistance with Depth	10
		20	Solid Rock A more Solid Compitent Bedrock Fracture Zone	20 Grout 0' to 24' Bentonite 24' to 26'
		30	Fracture Zone	30 Casing 0' to 27'
		40	Total Depth	40 Sand 26' to 42' Screen 27' to 42'
		50		50
		60		60

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Geologist Log — Ecological Services, Inc

Job #: ES-0675		North Mecklenburg Landfill	Well #: 6-A Page 1 of 1
County: Mecklenburg	State: NC	Date Begin: 02/02/95 Date End: 02/03/95	Casing Height: 2.0' Land Surface Elevation:
Lat.:	Long.:	Drilled By: Badger Well Drilling	Static Water Level:
Grid Coor.:		Logged By: Mike Magnetti	Development Method:
Tests:		Drilling Method: Air	Sampling Method:
Grout: 5% bentonite: 0' to 48.3'		Seal: 48.3' to 50.3'	Gravel Pack: 8/20 Silica Sand: 50.3' to 66.3'
Casing Type: Sch 40 PVC	Diameter: 2"	Depth: 0' to 51.3'	Hole Dia.: 6"
Screen Type: Sch 40 PVC	Diameter: 2"	Slot: 0.010-inch Depth: 51.3' to 66.3'	Total Depth: 66.3'

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	Brown and tan medium to fine grained silty sand	0
			Weathered Saprolitic Bedrock	
		10		10
		20	Fracture Zone	20
		30		30
		40		40
				Grout 0' to 48.3'
		50		Bent. 48.3' to 50.3'
			Fracture Zone	Casing 0' to 51.3
		60		60
				Sand 50.3' to 66.3'
				Screen 51.3' to 66.3'

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Geologist Log

Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: MW-8 Page 1 of 2
County: Mecklenburg State: NC	Date Begin: 1-10-94 Date End: 1-14-94	Casing Height: Land Surface Elevation:
Lat.: Long.:	Drilled By: Graham & Currie	Static Water Level:
Grid Coor.:	Logged By: Ben Hope	Development Method:
Tests:	Drilling Method: Air Rotary	Sampling Method:

Grout: 5% bentonite 0 – 55 ft Seal: bentonite 55 – 57.5 ft Gravel Pack: FX 50 sand 57.5 to 80.0 ft

Casing Type: Sch 40 PVC Diameter: 2" Depth: 0 – 60 ft Hole Diameter: 6"

Screen Type: Sch 40 PVC Diameter: 2" Slot: 0.010-inch Depth: 60 – 80 ft Total Depth: 80 ft

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	0 – 20.0 ft: Light Brown Silty Medium Sand with Some Pebbles	0
		10		10
		20	20.0 – 50.0 ft: Brown Silty Fine Sand	20
		30		30
		40		40
		50	50.0 – 80.0 ft: Bedrock Sampled as Gray Silty Coarse Sand with Pebbles and Rock Fragments Abundant	50
		60		Grout (0 – 55 ft); Bentonite (55 – 57 ft); 60 Casing to 60 ft

Geologist Log — *Ecological Services, Inc*

Job #: ES-0675	North Mecklenburg Landfill	Well #: MW-8	Page 2 of 2
County: Mecklenburg State: NC	Date Begin: 1-10-94 Date End: 1-14-94	Casing Height:	Land Surface Elevation:
Lat.: Long.:	Drilled By: Graham & Currie	Static Water Level:	
Grid Coor.:	Logged By: Ben Hope	Development Method:	
Tests:	Drilling Method: Air Rotary	Sampling Method:	
Grout: 5% bentonite 0 – 55 ft	Seal: bentonite 55 – 57.5 ft	Gravel Pack: FX 50 sand 57.5 to 80 ft	
Casing Type: Sch 40 PVC	Diameter: 2" Depth: 0 – 60 ft		Hole Diameter: 6"
Screen Type: Sch 40 PVC	Diameter: 2" Slot: 0.010-inch	Depth: 60 to 80 ft	Total Depth: 80 ft

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		60		60
		70		70
		80	Boring Terminated at 80.0 ft	Sand (57.5 – 80 ft) / Screen (60 to 80 ft) / 80
		90		90
		100		100
		110		110
		120		120

Geologist Log

Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: MW-10
County: Mecklenburg State: NC	Date Begin: 1-10-94 Date End: 1-11-94	Casing Height: Land Surface Elevation:
Lat.: Long.:	Drilled By: Graham & Currie	Static Water Level:
Grid Coor.:	Logged By: Ben Hope	Development Method:
Tests:	Drilling Method: Hollow Stem	Sampling Method:

Grout: 5% bentonite 0 – 4.5 ft Seal: bentonite 4.5 – 7 ft Gravel Pack: FX 50 sand 7 – 19 ft

Casing Type: Sch 40 PVC Diameter: 2" Depth: 0 – 9 ft Hole Diameter: 4"

Screen Type: Sch 40 PVC Diameter: 2" Slot: 0.010-inch Depth: 9 – 19 ft Total Depth: 19 ft

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
		0	0 – 19.0 ft: Grayish Brown Sandy Fine Silt	0
				Grout (0 – 4.5 ft)
				Bentonite (4.5 – 7 ft)
				Casing to 9 ft
		10		10
				Sand (7 – 19 ft) / Screen (9 – 19 ft)
			Boring Terminated at 19 ft	
		20		20
		30		30
		40		40
		50		50
		60		60

Geologist Log

Ecological Services, Inc

Job #: ES-0675	North Mecklenburg Landfill	Well #: 11	Page 1 of 1
County: Mecklenburg State: NC	Date Begin: 02/02/95 Date End: 02/03/95	Casing Height: 2.0'	Land Surface Elevation:
Lat.: Long.:	Drilled By: Badger Well Drilling	Static Water Level:	
Grid Coor.:	Logged By: Mike Magnetti	Development Method:	
Tests:	Drilling Method: Air	Sampling Method:	
Grout: 5% bentonite 0' to 62.8'	Seal: 62.8' to 64.8'	Gravel Pack: 8/20 Silica Sand: 64.8' to 80.8'	
Casing Type: Sch 40 PVC	Diameter: 2" Depth: 0' to 65.8'		Hole Dia.: 6"
Screen Type: Sch 40 PVC	Diameter: 2" Slot: 0.010-inch	Depth: 65.8' to 80.8'	Total Depth: 80.8'

PID/FID Reading (ppm)	Penetration Resistance	Depth (ft)	Lithology/Remarks	Well Completion
	6 – 10 – 50/5	0	Brown and tan medium to fine silty sand	0
		10	Weathered Bedrock	10
			Fracture Zone	
		20		20
			Fracture Zone	
		30		30
		40	Fracture Zone	40
		50		50
			Grout 0' to 62.8'	
			Bentonite 62.8' to 64.8'	
		60	Sand 64.8' to 80.8'	60
			Casing 0' to 65.8'	
			Screen 65.8' to 80.8'	

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APPENDIX B

Sampling and Analysis Requirements

SAMPLING AND ANALYSIS REQUIREMENTS
CONSTRUCTION AND DEMOLITION LANDFILLS
N.C. SOLID WASTE SECTION

LAB CERTIFICATION REQUIREMENTS:
The Solid Waste Section now requires water quality sample analysis by a laboratory certified by the Division of Environmental Management for groundwater analysis (15A NCAC 2H .0800). The laboratories used for water quality analysis for Solid Waste Section facilities shall be certified under the Division of Environmental Management (DEM) Certification program for the approved methods and at the approved levels of certification.

SAMPLING ANALYTICAL METHODS AND REPORTING LIMITS:
Each parameter on the following constituent list shall be certified at the designated level and an appropriately certified method used for the sample analysis. The data shall be reported at the specified Practical Quantitation Limit (PQL).

Parameter	**Certification** by DEM	**PQL** in ppb
Arsenic	Metals, Group I - low level	10
Barium	Barium (20)	500
Cadmium	Metals, Group I - low level	1
Chromium	Metals, Group I - low level	10
Lead	Metals, Group I - low level	10
Mercury	Mercury (21)	1
Selenium	Metals, Group I - low level	20
Silver	Metals, Group II - low level	10

Volatile Organic Compounds
For the parameters and PQLs required for volatile organic compound analysis, refer to the next page of this attachment. For volatile organic analysis the laboratory shall be certified for an SW-846 GC/MS Method (8240 or 8260). The recommended method of analysis is EPA Method 8260.

SAMPLING AND ANALYSIS:
In addition to sampling for the constituents referenced above, all sampling should also include field testing of pH, temperature, and specific conductivity. EPA requires analysis for total metals. No filtering of samples is allowed. The 3030C preparation method for metals analysis is not allowed.

January 1995

VOLATILE ORGANIC COMPOUNDS

ORGANIC CONSTITUENT	PQL (UG/L)	ORGANIC CONSTITUENT	PQL (UG/L)
(16) ACETONE	100	(40) T-1,3-DICHLOROPROPENE	10
(17) ACRYLONITRILE	200	(41) ETHYLBENZENE	5
(18) BENZENE	5	(42) METHYL BUTYL KETONE	50
(19) BROMOCHLOROMETHANE	5	(43) METHYL BROMIDE	10
(20) BROMODICHLOROMETHANE	5	(44) METHYL CHLORIDE	10
(21) BROMOFORM	5	(45) METHYLENE BROMIDE	10
(22) CARBON DISULFIDE	100	(46) METHYLENE CHLORIDE	10
(23) CARBON TETRACHLORIDE	10	(47) MEK; 2-BUTANONE	100
(24) CHLOROBENZENE	5	(48) METHYL IODIDE	10
(25) CHLOROETHANE	10	(49) METHYL ISOBUTYL KETONE	100
(26) CHLOROFORM	5	(50) STYRENE	10
(27) CHLORODIBROMOMETHANE	5	(51) 1,1,1,2-TETRACHLOROETHANE	5
(28) DBCP	25	(52) 1,1,2,2-TETRACHLOROETHANE	5
(29) ETHYLENE DIBROMIDE	5	(53) TETRACHLOROETHYLENE	5
(30) O-DICHLOROBENZENE	5	(54) TOLUENE	5
(31) P-DICHLOROBENZENE	5	(55) 1,1,1,-TRICHLOROETHANE	5
(32) T-1,4-DICHLORO-2-BUTENE	100	(56) 1,1,2-TRICHLOROETHANE	5
(33) 1,1-DICHLOROETHANE	5	(57) TRICHLOROETHYLENE	5
(34) ETHYLENE DICHLORIDE	5	(58) CFC-11	5
(35) VINYLIDENE CHLORIDE	5	(59) 1,2,3-TRICHLOROPROPANE	15
(36) CIS-1,2-DICHLOROETHENE	5	(60) VINYL ACETATE	50
(37) T-1,2-DICHLOROETHENE	5	(61) VINYL CHLORIDE	10
(38) PROPYLENE DICHLORIDE	5	(62) XYLENES	5
(39) CIS-1,3-DICHLOROPROPENE	10		

ALSO KNOWN AS: (21)-TRIBROMOMETHANE, (25)-ETHYL CHLORIDE, (26)-TRICHLOROMETHANE, (27)-DIBROMOCHLOROMETHANE, (28)-1,2-DIBROMO-3-CHLOROPROPANE, (29)-1,2-DIBROMOETHANE, (30)-1,2-DICHLOROBENZENE, (31)-1,4-DICHLOROBENZENE, (33)-ETHYLIDENE CHLORIDE, (34)-1,2-DICHLOROETHANE, (35)-1,1-DICHLOROETHENE (ETHYLENE), (36)-CIS-1,2-DICHLOROETHYLENE, (37)-TRANS-1,2-DICHLOROETHYLENE, (38)-1,2-DICHLOROPROPANE, (42)-2-HEXANONE, (43)-BROMOMETHANE, -CHLOROMETHANE, (45)-DIBROMOMETHANE, (46)-DICHLOROMETHANE, (47)-METHYL ETHYL KETONE, -IODOMETHANE, (49)-4-METHYL-2-PENTANONE, (53)-TETRACHLOROETHENE, PERCHLOROETHYLENE, (55)-METHYLCHLOROFORM, (57)-TRICHLOROETHENE, (58)-TRICHLOROFLUOROMETHANE

TABLE 1
Gauging Data for Newly Installed Groundwater Monitoring Wells North Mecklenburg Landfill

DATE	LOCATION	DTW	TOC ELEVATION	GW ELEVATION
2/5/95	MW-1a	14.47	688.13	673.66
2/5/95	MW-4a	29.64	720.86	691.22
2/5/95	MW-6a	58.66	741.55	682.89
2/5/95	MW-11	65.65	750.24	684.59

DTW - Depth to Water
TOC - Top of Casing
GW - Groundwater
All measurements given in feet